PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improved Valve Mechanism particularly for Hydraulic Shock Absorbers

We, GENERAL MOTORS CORPORATION, a Company incorporated under the laws of the State of Delaware, in the United States of America, of Grand Boulevard, in the City of Detroit, State of Michigan, in the United States of America, (Assignee of MEARICK FUNKHOUSER, citizen of the United States of America, of 225, Wisteria Drive, Dayton, Ohio, United States of America), do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to valve mechanism which is of particular utility in hydraulic shock absorbers.

Valve mechanism according to the invention is of simple and sturdy structure and comprises a valve held on its seat in a valve cage by means of a plurality of spring fingers which by means of a central tubular extension on the valve also locate and guide the valve centrally of the aperture in the cage.

A preferred embodiment of the present invention is shown, by way of example in the accompanying drawings in which:—

Fig. 1 is a plan of a valve mechanism according to the invention;

Fig. 2 is a section on the line 2—2 of Fig. 1; and

Fig. 3 shows how valve mechanism of the present invention can be applied to a telescopic type, hydraulic shock absorber for which it is particularly adapted.

The valve mechanism of the present invention is operative differentially to control fluid flow in opposite directions. The mechanism comprises a valve cage 20 having a central opening 21 therethrough, and a recess 22 in one end. An annular ridge 23 in the bottom surface of this recess surrounds the opening 21 and forms a valve seat. To fit into the cylinder 24 of a telescopic type hydraulic shock absorber (Fig. 3) an annular wall 25 is formed on the valve cage, and an outwardly extending flange 26 engages the edge of the cylinder 24 when the valve mechanism is placed in position.

The two-way valve mechanism comprises also a centrally apertured valve 30 termed "the intake valve," having coaxial oppositely extending tubular portions 31 and 32, the latter extending through the opening 21 of the valve cage 20, to allow annular clearance. An annular plate 33 forms the contacting surface of the valve 30 engageable with the valve-seat 23. A notch 34 in the periphery of the plate forms a constantly open orifice permitting a restricted fluid flow.

A spring disc comprising a ring-shaped frame portion 35 fits into the recess 22 of the valve cage and is secured therein by swaging the edge 36 of the valve cage inwardly and over the portion 35. Extending inwardly and radially from said frame portion 35 are a plurality of resilient fingers 37, the inner ends terminating short of the tubular extension 31 of the valve 30, and pressing against the valve 30. The portion 36 of the valve cage 20 is swaged over and upon the ring portion 35 of the spring until the desired pressure by fingers 37 upon the valve 30 is attained. Thus the valve 30 is yieldably urged upon its valve seat 23 in the valve cage by the resilient fingers 37, which, having their inner ends in close proximity to the tubular extension 31 of the valve form a guide to maintain the valve substantially concentric with the annular valve seat 23. This assures complete coverage of the opening 21 by the valve at all times as it is seated upon the ridge. This spring with its ring portion 35 and radial fingers 37 furthermore not only seats the valve on its seat and provides a pilot for it, but also by virtue of increasing stress with displacement limits its movement away from its seat 23.

A plug or piston valve 40 having a tubular end portion 41 slidably fitting in the tubular extension 31 of the valve, has a side slot 42 normally closed by the extension 31. An outwardly extending flange 43 engages the inner surface of the valve 30 and is urged into such engagement by a surrounding spring 44 fitted between the flange 43 and an abutment spider 45 fixed in tubular portion 32. The plug valve 40 extends through an opening in the spider 45 which thus acts not only as an abutment for spring 44 but also as a guide for the plug valve 40.

When inserted in the bottom end of the cylinder 24, the valve mechanism rests upon radial ribs 50 within a closure member 51 which is secured to an outer tubular member 52 of the shock absorber surrounding the cylinder 24 and forming the reservoir chamber 53. A piston 54 fits in cylinder 24, on a rod 55 attached at its outer end to the relatively movable membed 56 of the shock absorber. The other relatively movable portion of the shock absorber comprises the cylinder 24, outer casing 52, end cap or closure member 51 and the mounting ring 56. Piston 54 has fluid flow control mechanism controlling the transfer of fluid from one side of the piston to the other as it is reciprocated.

As the piston is moved downwardly in the cylinder 24 it forces some of the fluid in chamber 60 through the piston into upper chamber 61 which, due to the increasing length of the rod 55 therein cannot receive all of the fluid displaced from chamber 60. Consequently the remainder of the displaced fluid moves plug valve 40 relatively to valve 30 against spring 44 so that the slot 42 is moved outside the tubular extension 31 thereby establishing a restricted fluid flow into the tubular extension 32 and past the spider 45 into the reservoir 53. As soon as the fluid pressure upon the plug valve 40 is reduced or eliminated, the spring 44 returns it to the normal position shown, thereby shutting off fluid flow through the plug valve.

As the piston 54 moves upwardly in the cylinder 24, pressure upon the fluid in chamber 61 will cause its displacement through the piston 54 into the chamber 60. The amount of fluid in chamber 61 is not sufficient completely to fill chamber 60 now being enlarged. The valve 30 will therefore be lifted from its seat 23 in the valve cage 20 against resilient fingers 37, thereby permitting fluid to flow from the reservoir 53 into chamber 60.

The valve mechanism is comparatively silent inasmuch as vibrations during operation are practically eliminated. The side slot 42 in the plug valve 41 causes a one-sided discharge from the plug valve thereby setting up a non-axial reaction which urges the plug valve to one side, practically eliminating the possibility of any vibrations by this valve.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A valve mechanism comprising a centrally apertured valve-cage having a valve seat, and a valve seatable on the valve seat to close the aperture and having a central tubular extension, and a spring urging the valve upon its seat and maintaining it substantially centrally of the aperture, comprising an outer frame secured to the valve cage and resilient fingers extending inwardly from the frame engaging the valve and each terminating in close proximity to the central tubular extension on said valve.

2. A valve mechanism comprising a centrally apertured valve-cage having a valve-seat, a valve coacting with said valve-seat and having a central opening and tubular portions extending from each side thereof, a spring comprising a frame portion secured to the valve-cage and resilient fingers extending from the frame and terminating in close proximity to one tubular extension on the valve for maintaining it centrally of and on the valve-seat, a plug valve slidably supported in said one tubular extension and normally closing the central opening in the valve but movable to establish a restricted flow therethrough, an abutment spider carried by the other tubular extension of the valve and a spring interposed between the spider and plug valve urging the latter to close the opening in the valve.

3. A valve mechanism according to claim 2 in which said one tubular extension is of less diameter than said other tubular extension between which and the valve cage is an annular space for the flow of fluid when the valve is lifted off its seat.

4. A valve mechanism according to claim 1, 2, or 3 having an annular plate between the valve and valve seat, said plate having a peripheral notch which, when the valve is seated upon the valve-cage, forms a constantly open fluid flow orifice.

5. A valve mechanism substantially as hereinbefore particularly described and as shown in Figs. 1 and 2 of the accompanying drawings.

6. A telescopic hydraulic shock absorber having a valve mechanism according to any of the preceding claims,

between the reservoir and one of the pressure chambers.

Dated this 1st day of March, 1949.
E. WILLIAMSON,
Chartered Patent Agent.

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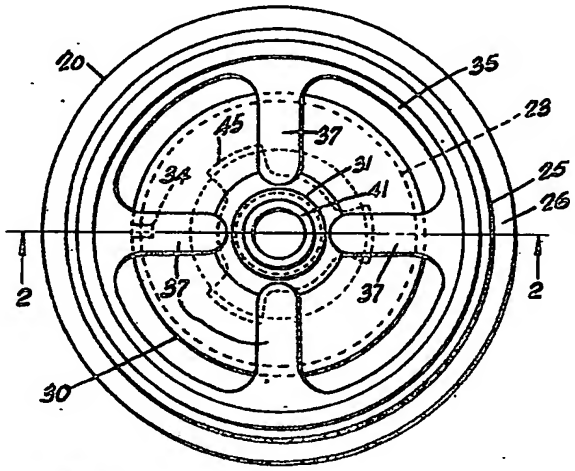

Fig. 1

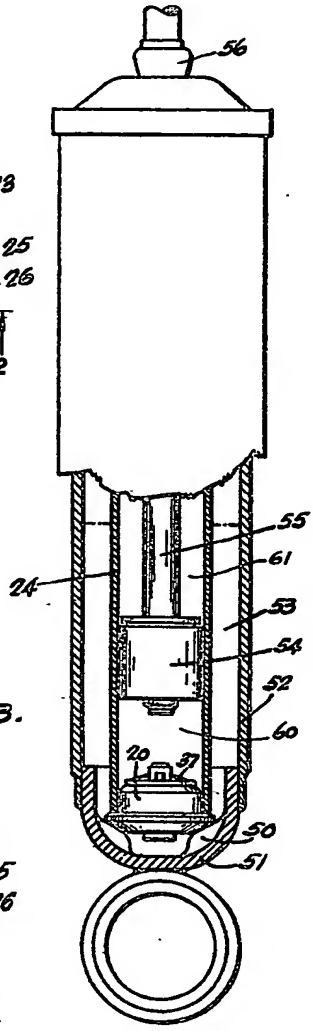

Fig. 3.

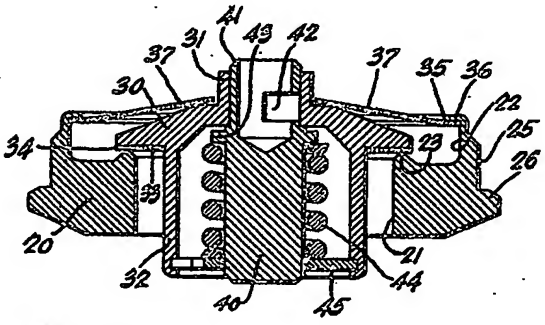

Fig. 2.

H.M.S.O. (M.F.P.)